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Project Summary

Solvent-Based to Waterbased Adhesive-Coated Substrate Retrofit

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The coated and laminated substrate manufacturing industry was selected as part of the National Risk Management Research Laboratory's (NRMRL's) support of the U.S. Environmental Protection Agency's (EPA's) 33/50 Program because of its significant air emissions of toluene and methyl ethyl ketone. NRMRL reviewed the potential equipment cleaning benefits of retrofitting equipment for the use of waterbased adhesives. During the investigation, it became apparent that retrofitting solvent-based equipment to accept waterbased adhesives can be very complicated. This report gives results of a review of the issues and obstacles associated with retrofitting.

This Project Summary was developed by EPA's National Risk Management Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Background

As a result of the Pollution Prevention Act of 1990, the U.S. Environmental Protection Agency (EPA) established the 33/50 Program, which calls for voluntary industry reductions in releases of 17 high-priority toxic chemicals, listed by mass of emissions:

- Toluene
- Xylenes
- 1,1,1-Trichloroethane
- Methyl Ethyl Ketone
- Dichloromethane
- Chromium and Compounds
- Lead and Compounds
- Trichloroethylene
- Methyl Isobutyl Ketone
- Tetrachloroethylene
- Benzene
- Chloroform
- Nickel and Compounds
- Cyanide and Compounds
- Carbon Tetrachloride
- Cadmium and Compounds
- Mercury and Compounds

The goal of the 33/50 Program is to reduce the total amount of these chemicals released into the environment and transferred off-site by 33% by the end of 1992 and by 50% by the end of 1995. These reductions will be based on the Toxic Chemicals Release Inventory (TRI), with 1988 as the base year.

In support of the 33/50 Program and EPA's pollution prevention goals, EPA's National Risk Management Research Laboratory (NRMRL) is investigating ways to reduce air emissions of these 17 chemicals through pollution prevention. The Pollution Prevention Act of 1990 defines pollution prevention as source reduction, or "any practice which reduces the amount of any hazardous substance, pollutant, or contaminant entering the waste stream or otherwise released to the environment (including fugitive emissions) prior to recycling, treatment, or disposal; and reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants." Pollution prevention offers economic and reduced health and ecological risk benefits to many sectors of society that may not be available through traditional pollution control methods.

In 1991, NRMRL representatives met with industry, academia, and state environmental agency representatives to identify several source categories deserving of pollution prevention research. Two criteria were used to select the industrial categories for study: annual toxics emissions and the potential for pollution prevention opportunities. First, the TRI was reviewed to identify categories with the greatest mass emissions of the 33/50 chemicals. Categories with the greatest emissions were then ranked according to the potential for successful pollution prevention projects resulting in significant reductions of 33/50 chemical releases. One of the industries identified during the 1991 meeting was the adhesives-coated and laminated paper manufacturing industry [Standard Industrial Classification (SIC) 2672]. This industry was chosen because of significant air emissions of 33/50 Program chemicals methyl ethyl ketone (MEK) and toluene as reported through the TRI.

In October 1991, a focus group meeting was held during which NRMRL, pollution prevention experts, and representatives of the adhesives-coated and laminated paper manufacturing industry discussed pollution prevention projects that would support the 33/50 Program. Meeting participants indicated that the coatings and coating application steps are the largest source of toluene and MEK emissions; therefore, retrofitting equipment for the use of waterbased adhesives would present a good opportunity to implement pollution prevention techniques. As a result of this meeting and preliminary industry inquiries, the scope of the industry investigation was later expanded to include other coating and substrate varieties (such as those included in SIC 2671-Coated and Laminated Packaging Paper and Plastics Film) whose manufacturing methods are similar, thus expanding technology transfer over a wider range of industries. The retrofit research project fulfills part of EPA's goal to stimulate the development and use of products and processes that result in reduced pollution.

Objectives

As part of the original scope of work for *Improved Equipment Cleaning in the Coated and Laminated Substrate Manufacturing Facilities (Phase I)*, the potential equipment cleaning benefits of retrofitting equipment for the use of waterbased adhesives were reviewed. During the review, it became apparent that the conversion of solvent-based adhesive-coated products to waterbased adhesives can be very complicated. Therefore, EPA invested resources in documenting this conversion. The results of this study are presented in four volumes entitled ***Solvent-Based to Waterbased Adhesive-Coated Substrate Retrofit—***

Volume I:	*Comparative Analysis*
Volume II:	*Process Overview*
Volume III:	*Label Manufacturing Case Study: Nashua Corporation*
Volume IV:	*Film and Label Manufacturing Case Study: FLEXcon Corporation*

Volume I details results of a comprehensive study to identify the issues and barriers associated with retrofitting existing solvent-based equipment to accept waterbased adhesives, and compares the compatibility of waterbased adhesive performance levels with current solvent-based adhesive applications. Using Volume I, NRMRL is examining the technology transfer potential of documenting requirements for several coated and laminated substrate manufacturers who have converted some or all of their coating capacity from solvent-based to waterbased adhesives so that other manufacturers can consider the benefits of retrofitting.

Volume II gives results of an initial study to identify the issues and barriers associated with retrofitting existing solvent-based equipment to accept waterbased adhesives. This report is intended only as an introduction to the technical, economic, and environmental issues associated with converting from solvent-based to waterbased adhesive coating processes. Its purpose is to define the terms commonly used within the industry, introduce retrofit concepts, and identify issues requiring further investigation.

Volume III is a case study of the waterbased retrofit of Nashua Corporation's Omaha, Nebraska, facility (Nashua). Nashua is a label and label stock manufacturing facility that completed a total conversion from solvent-based to waterbased adhesives in late 1993. This conversion formally started in 1987. Nashua's products are generally aimed at high-volume commodity uses, such as food and consumer product packaging labels. Nashua converted to waterbased adhesives primarily to avoid escalating regulatory costs associated with solvent-based adhesives. Equipment, cost, performance, environmental, and marketing issues pertaining to Nashua's conversion are explained in Volume III.

Volume IV describes the implications of and barriers associated with waterbased adhesive use at FLEXcon Company's Spencer, Massachusetts, facility (FLEXcon). FLEXcon produces a variety of films and labels for use in a multitude of applications that fall into six main categories: graphic films, packaging labels, electronic printing labels, microembossed films, medical films and labels, and custom-performance products. FLEXcon currently processes approximately 30% of their products with waterbased adhesives and the remainder with solvent-based adhesives. FLEXcon's usage level of solvent-based adhesives has remained static for a number of years, and they currently have no plans to change it. However, FLEXcon's use of waterbased adhesives has steadily increased since their introduction to the facility in the early 1970s. FLEXcon anticipates that future growth in their adhesive manufacturing will be in waterbased and other non-solvent adhesive technologies. FLEXcon officials also believe that improvements in waterbased and other non-solvent adhesive technologies may allow them to convert solvent-based products in the future.

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Chester A. Vogel (Volumes I, III, and IV) and **Michael Kosusko** (Volume II) are the EPA Project Officers (see below).
The complete report, entitled "Solvent-Based to Waterbased Adhesive-Coated Substrate Retrofit," consists of four volumes:
"Volume I, Comparative Analysis" (Order No. PB96-180435; Cost: $31.00, subject to change)
"Volume II, Process Overview" (Order No. PB96-180443; Cost: $21.50, subject to change)
"Volume III, Label Manufacturing Case Study: Nashua Corporation" (Order No. PB96-180450; Cost: $21.50, subject to change)
"Volume IV, Film and Label Manufacturing Case Study: FLEXcon Corporation" (Order No. PB96-180468; Cost: $19.50, subject to change)
The complete set of four volumes (Order No. PB96-180427; Cost: $49.00, subject to change).
The above reports will be available only from
National Technical Information Service
5285 Port Royal Road
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Telephone: 703-487-4650
The EPA Project Officer can be contacted at
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